

Supporting Information-Methane (CH₄) wettability of clay coated quartz at reservoir conditions

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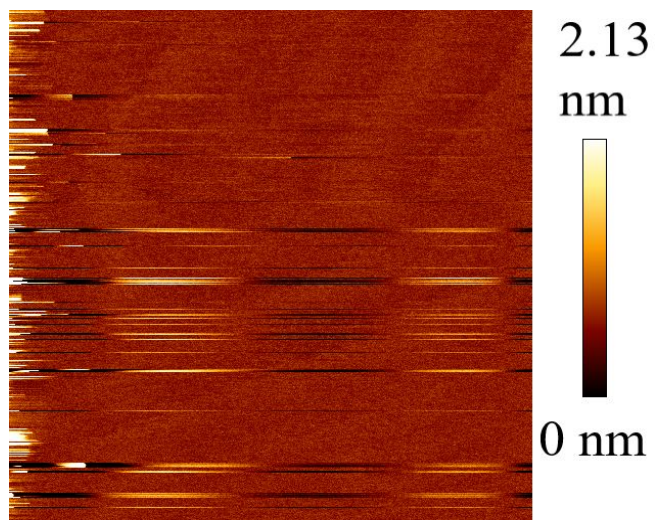
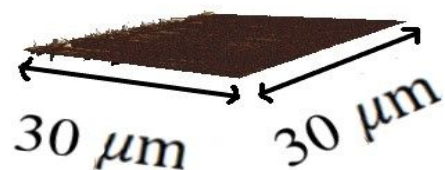
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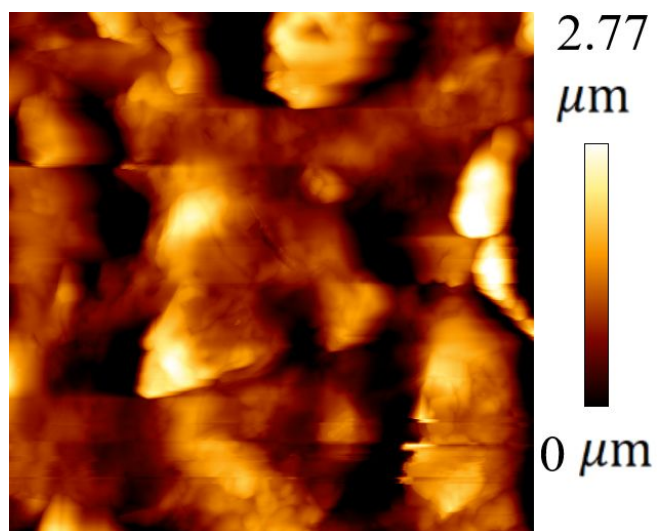
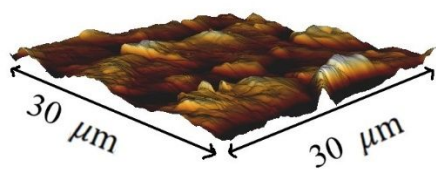
3D topography

Deflection signal



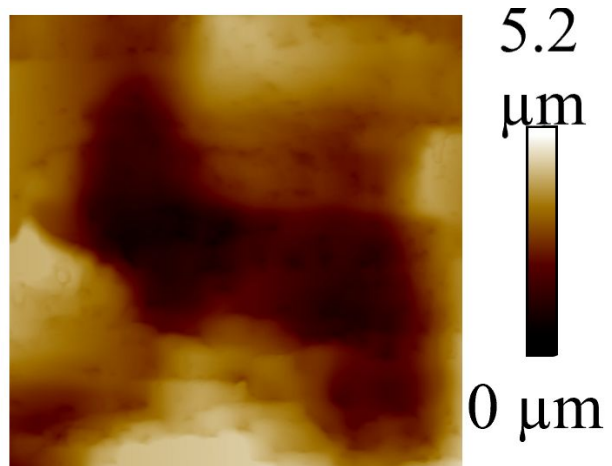
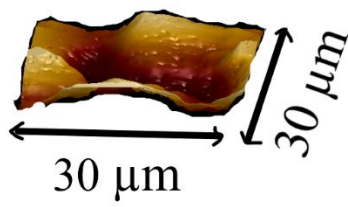
RMS = 483.7 pm

(a)



RMS = 629.8 nm

(b)



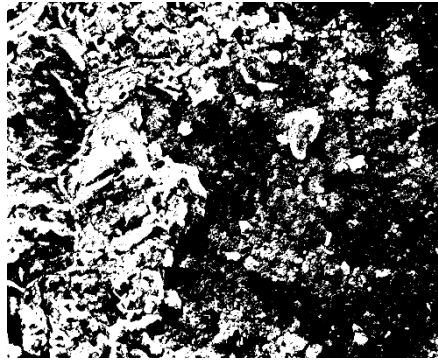
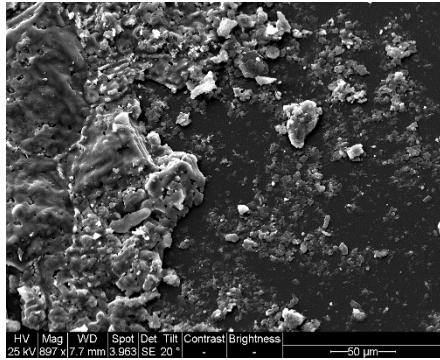
RMS = 863 nm

(c)

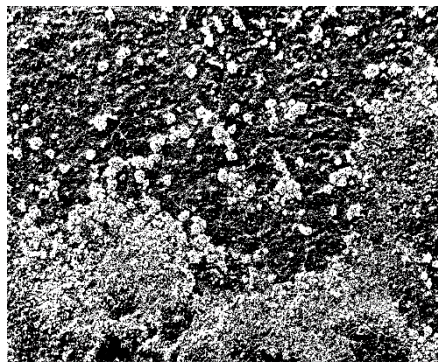
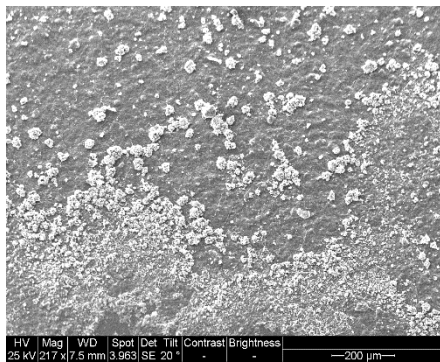
SI-Figure 1. Atomic Force Microscopy (AFM) images of a) clean, b) kaolinite coated and c) montmorillonite coated quartz. Note that the poor signal is due to surface properties caused by coating.

Original

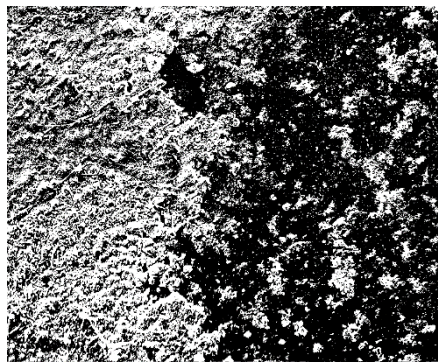
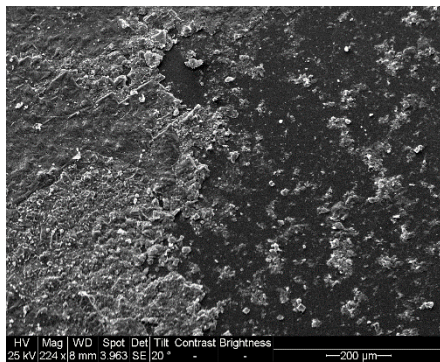
Binary



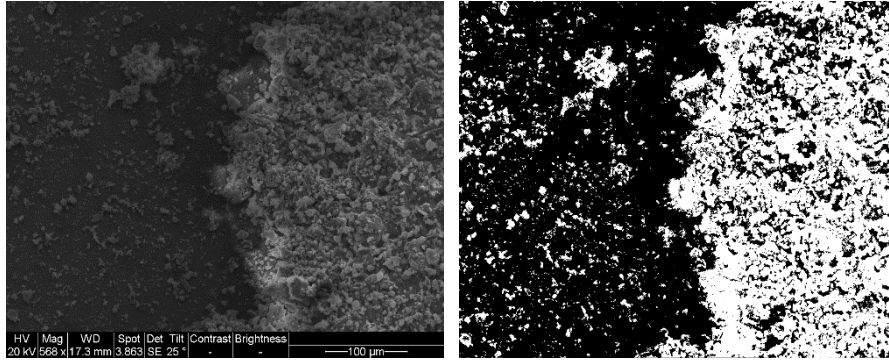
(a) Kaolinite coverage = 36.37%



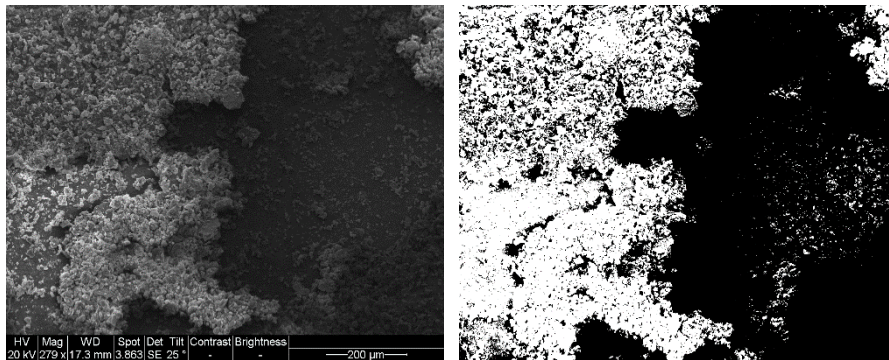
(b) Kaolinite coverage = 39.12%



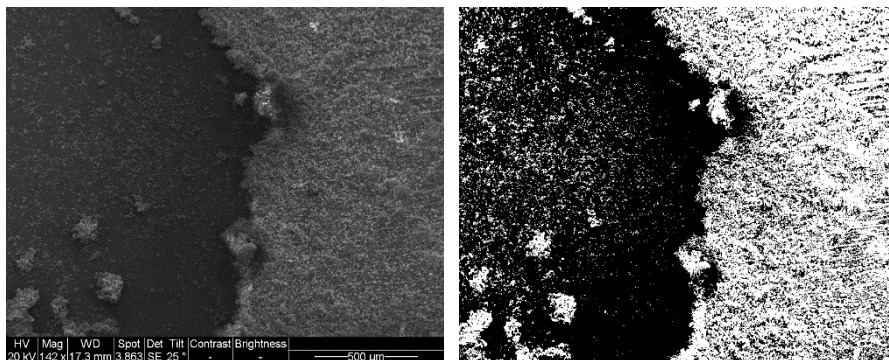
(c) Kaolinite coverage = 36.96%



(d) Montmorillonite coverage = 38.17%



(e) Montmorillonite coverage = 38.9%



(f) Montmorillonite coverage = 39.99%

SI-Figure 2. Random three areas of original and binary SEM images of kaolinite (a-c) and montmorillonite (d-f) coating. The light color is clay particle and the dark color is quartz

substrate. The threshold was determined by the average RGB based on the whole area of the chosen image.

SI-Table 1. The total salinities of clay suspensions in DI water and 1.5 wt% NaCl brine at room temperature (i.e. $20 \pm 1^\circ\text{C}$)

Samples	Salinity [wt%]			Mean
	Measurement 1	Measurement 2	Measurement 3	
DI water	0.0058	0.0058	0.0058	0.006
1.5 wt% NaCl	1.5012	1.5	1.4999	1.5
2 wt% Kaolinite in DI water	0.01	0.01	0.01	0.01
2 wt% Montmorillonite in DI water	0.0061	0.006	0.006	0.006
2 wt% Kaolinite in 1.5 wt% NaCl	1.5011	1.5012	1.5	1.5
2 wt% Montmorillonite + 1.5 wt% NaCl	1.5012	1.4999	1.5011	1.5

SI-Table 2. Advancing contact angles for various systems at 10 MPa and 50°C .

Systems	Advancing contact angle [$^\circ$]			Mean
	Measurement 1	Measurement 2	Measurement 3	
5 wt% NaCl-CH ₄ -kaolinite coated quartz	22	23	21	22
5 wt% NaCl-CH ₄ -montmorillonite coated quartz	23	23	22	23
5 wt% MgCl ₂ -CH ₄ -kaolinite coated quartz	25	23	24	24
5 wt% MgCl ₂ -CH ₄ -montmorillonite coated quartz	24	24	24	24